

DRAFT Managed Lane Guidance - October 23, 2012**I. What are Managed Lanes? - Understanding the Terms**

The term “managed lanes” has different meanings to different people. In some cases the term is commonly thought of as high-occupancy toll (HOT) lanes. In other cases a broader definition is intended, one in which a variety of management tools and techniques are combined in order to improve freeway efficiency and meet certain corridor and community objectives. This broader definition of “managed lanes” makes more sense for use in Colorado and includes HOV lanes, value priced lanes (including HOT lanes), and exclusive or special use lanes (such as express, bus-only, or truck-only lanes).

Figure 1 is a diagram that captures the potential lane management applications that fall into this broad definition of “managed lanes”. On the left of the diagram are the applications of a single operational strategy – pricing, vehicle eligibility, or access control - and on the right are the more complicated managed lane facilities that blend more than one of these strategies. The multifaceted facilities on the far right of the diagram are those that incorporate or blend multiple lane management strategies.

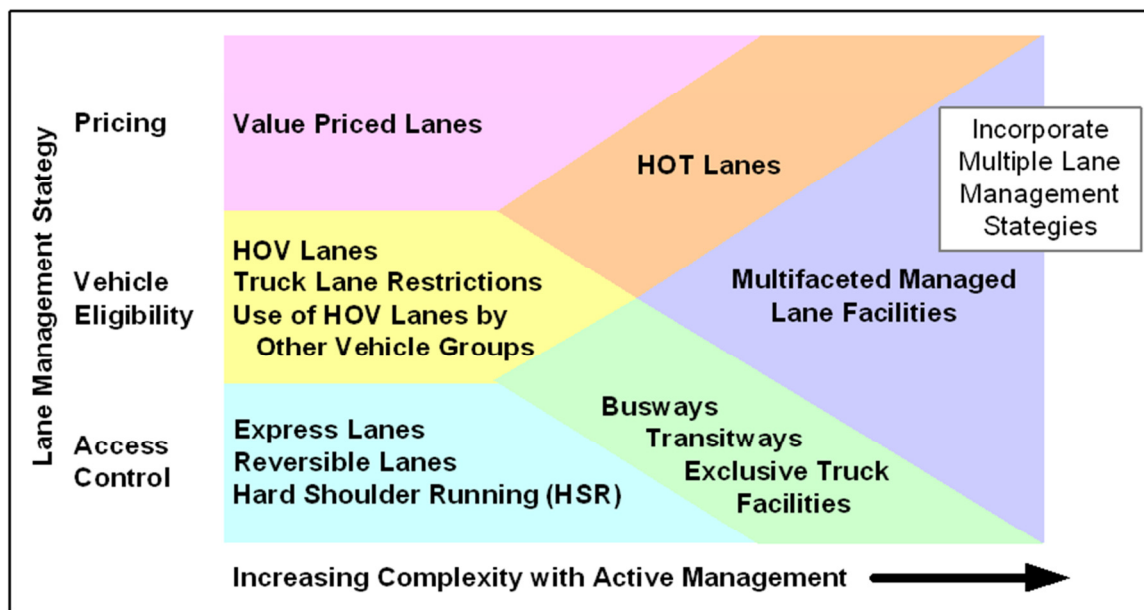


Figure 1 Lane Management Strategies

The common themes among the different managed lane strategies in use today are as follows:

- The managed lane concept is typically a “freeway-within-a-freeway” facility, where a set of lanes within the freeway cross-section is physically separated from general purpose lanes;
- The facility incorporates a high degree of operational flexibility, so that over time operations can be actively managed to respond to growth and changing needs;
- The operation of the facility is managed using a combination of tools and techniques in order to continuously achieve an optimal condition, such as free-flow speeds;
- The principal management strategies can be categorized into three groups: pricing, vehicle eligibility, and access control.

The following are some “operational” techniques and definitions used for managing lanes:

- Active Traffic Management: The ability to dynamically manage traffic flow based on prevailing traffic conditions. (TRB Joint Subcommittee on Active Traffic Management) Examples include variable speed limits, peak period shoulder lanes, and variable pricing.
- Bus Rapid Transit (BRT): A term applied to a variety of public transportation systems using buses to provide faster, more efficient service than an ordinary bus line. Often this is achieved by making improvements to existing infrastructure, vehicles and scheduling. The goal of these systems is to approach the service quality of rail transit while still enjoying the cost savings and flexibility of bus transit.
- Exclusive Lanes: Exclusive lanes provide certain vehicles, usually designated by vehicle type, an exclusive operational lane. Examples include:
 - Busways: A bus-only roadway that is separated from the rest of traffic.
 - Transitways: Transit-only roadways separated from the rest of traffic.
 - Exclusive Truck Facilities: Roadways using strategies that attempt to mitigate the effects of increasing truck traffic.
- Express Lanes & Tolloed Express Lanes: Lanes separated from general purpose lanes by a striped buffer or a raised median barrier. Lanes whose demand is managed to maintain reliable, fast operation even during peak periods. Express lanes can be tolled. Tolls are collected either by manned toll booths or computer controlled image recognition and electronic tagging systems.
- High Occupancy Vehicle (HOV) Lanes: a high-occupancy vehicle lane (also called an HOV lane or carpool lane) is a lane reserved for vehicles with a driver and one or more passengers, often referred to as HOV2 (two or more occupants) or HOV3 (three or more occupants).
- High Occupancy Toll (HOT) Lanes: Are a form of express lane where a toll is enacted on single occupant vehicles who wish to use roads, or lanes within roads, designated for the use of high occupancy vehicles (HOVs). In some cases, tolls may also be enacted on a HOV lane. High occupancy tolls are a form of road pricing. These would be similar to the existing High Occupancy Tolloed (HOT) lanes on I-25 between 84th Avenue and 20th Street in Denver.
- Lane Restrictions: Lane restrictions are management strategies that limit certain types of vehicles to specified lanes within the roadway. The most common reasons for implementing lane restrictions are:
 - improved highway operations,
 - reduced accidents,
 - pavement structural considerations, and
 - restrictions in construction zones
- Managed Lanes: Are highway facilities or a set of lanes where operational strategies are proactively implemented and managed in response to changing conditions. (FHWA, *Managed Lanes: A Primer*)
- Peak Period Shoulder (PPS) Lanes (sometimes referred to as Hard Shoulder Running): using the shoulder as a travel lane during peak periods to minimize recurrent congestion. Peak Period Shoulder Lanes can also be used to manage traffic and associated congestion immediately after an incident. It is typically applied with variable speed limits.
- Reversible Lanes (also known as counterflow lanes or contraflow lanes): A reversible lane is a lane in which traffic may travel in either direction, depending on certain conditions, typically time of day. A reversible lane is meant to improve traffic flow during rush hours.
- Value Pricing (also known as Congestion Pricing): employs road pricing strategies, including the idea of charging motorists a toll for travel during the most congested times or offering a

discount for traveling in the off-peak. Value priced lanes use pricing as the primary mechanism to regulate demand.

- Variable Pricing: The price of the tolled lane or facility varies by time of day due to demand and therefore is higher during peak periods and lower during off-peak periods. It encourages use of the road during less congested periods and allows traffic to flow more freely during peak periods.
- Dynamic Pricing: The price of the tolled lane or facility goes up as traffic volumes increase. Increasing pricing is to discourage congestion causing volumes of traffic in the tolled lanes. The price can increase at any time of day.
- Variable Speed Limits: dynamically and automatically reducing speed limits in or before areas of congestion, accidents, or special events to maintain flow and reduce risk of collisions due to speed differentials or short headways.

II. What are our Goals for Managed Lanes?

Goals and corresponding objectives associated with Managed Lane projects in Colorado include:

- Preserve and enhance mobility
 - Provide reliable and predictable travel times
 - Increase system efficiency and optimize the movement of people and goods
 - Provide congestion avoidance choices for the public
 - Improve emergency response
 - Enhance opportunities for economic growth through travel efficiencies
- Maximize person per vehicle throughput
 - Improve transit on-time performance
 - Enhance opportunities for transit expansion
 - Improve vanpool and carpool travel efficiency

Achieving these goals and objectives results in mobility benefits and maximizes operational efficiencies of the transportation system. Other benefits can also result such as providing sustainable transportation choices or environmental benefits such as a reduction in vehicle emissions resulting in improved air quality. In addition, some types of managed lanes such as tolled facilities have the added benefit of providing revenues to help pay for the improvement.

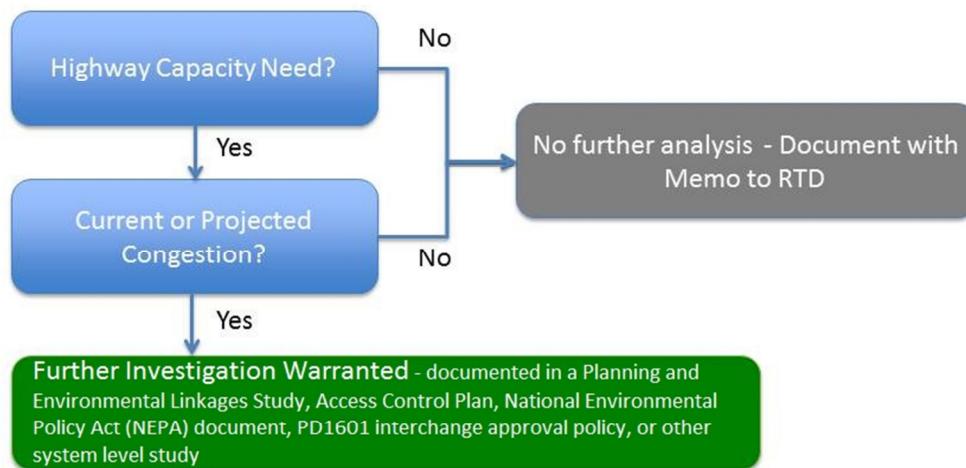
III. When Do You Consider Managed Lanes?

Consideration of Managed Lane strategies during planning and development of capacity improvements on state highway facilities in Colorado can occur in the following ways:

- During the planning process
- During project development
- During analysis of on-going projects

Documentation of the consideration of managed lanes as required in the policy directive can occur as shown in the following diagram.

Managed Lane Documentation



IV. Next Steps - What are Operating Principles of Managed Lanes?

Operating principles intended to guide decision-making during consideration, implementation, financing and monitoring of managed lanes will be developed in the future, including the use of System Engineering Analysis when the decision is to proceed with a managed lane strategy.

V. References

FHWA. (2006). *Congestion Pricing – A Primer*. Washington: US DOT – Federal Highway Administration.

FHWA. (2010). *Efficient Use of Highway Capacity Summary – Report to Congress*. Washington: US DOT - Federal Highway Administration.

FHWA. (2008). *Managed Lanes: A Primer*. Federal Highway Administration Office of Operations.